

ARMY RESEARCH LABORATORY



Volatile Organic Compound (VOC)
Compliant Zinc-Rich Primer,
MIL-P-46105

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ARL-TR-1141

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13. ABSTRACT (Maximum 200 words) Specification covers a ready-mixed, single-package, epoxy-based, zinc-rich primer for use on ferrous metal surfaces prior to spot welding. It is intended for application at a dry film thickness between 2.0 and 3.0 mils on parts fabricated from sheet metal. It is usually applied to the parts prior to assembly and must not adversely affect spot or gas welding. Since this specification represents old technology no longer used in the automotive industry and the only submitted commercial sample at low volatile organic compound (VOC) failed the corrosion test, it is recommended that this specification be canceled along with its associated work unit.				
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1. INTRODUCTION

1.1 Background Information. Specification MIL-P-46105, first issued in March 1966, covers a ready-mixed, single-package, epoxy-based, zinc-rich primer for use on ferrous metal surfaces prior to spot welding. It is intended for application at a dry film thickness between 2.0 and 3.0 mils on parts fabricated from sheet metal. It is usually applied to the parts prior to assembly and must not adversely affect spot or gas welding. This product can only be purchased from vendors listed on the Qualified Products List (QPL) for this specification.

1.2 Objectives. The purpose of this project is to revise this specification to meet the maximum 420 g/l volatile organic compound (VOC) content required by Federal statutes.

2. EXPERIMENTAL

2.1 Data Search. In reviewing this specification, we noted that there is one test requirement that could not be done in a coatings laboratory. Section 4.4.11, labeled Welding Characteristics, requires that 2,000 spot welds be made using thirty-two 4 × 12-in steel panels. We contacted the American Welding Society and solicited their opinion on this specification. They stated that this specification is based on a 25-yr old Ford Company welding test procedure on a product that the automobile industry no longer uses. They now use zinc-clad steel rather than zinc-rich coatings.

2.2 Vendor Search. The vendors listed in the current QPL were contacted concerning their level of interest in producing a new VOC compliant product. One company has disappeared, another has been bought out by a large multinational and has no interest in this product, and the third has a positive answer in that they have a product that may meet the VOC requirement. This product uses the same type of resins and pigments with a different blend of solvents.

2.3 Corrosion Testing. Two samples of paint were received from the one remaining vendor, the original QPL formula at 4.0 lb/g VOC and a new one with 3.5 lb/g VOC.

Cold-rolled steel panels were sprayed with both formulations and exposed to the salt spray test for 250 hr.¹

¹American Society for Testing and Materials (ASTM). "Standard Test Method of Salt Spray (Fog) Testing." ASTM B117-90, 1990.

Results: see Figures 1 and 2.

(1) At the scribe mark.

- QPL control sample - no corrosion.
- Low VOC sample - corrosion in 70–90% of the scribed area, no creepage.

(2) Panel surface.

- QPL control sample - dense no. 8 size blisters concentrated mostly in 1/4-in longitudinal rivulets.²
- Low VOC sample - medium dense no. 2 size blisters over the whole panel.²

3. RESULTS

Since this specification represents old technology no longer used in the automotive industry and the only submitted commercial sample at low VOC failed the corrosion test, it is recommended that this specification be canceled along with its associated work unit.

²American Society for Testing and Materials. "Standard Test Method for Evaluating Degree of Blistering Paints." ASTM D714-87, 1987.

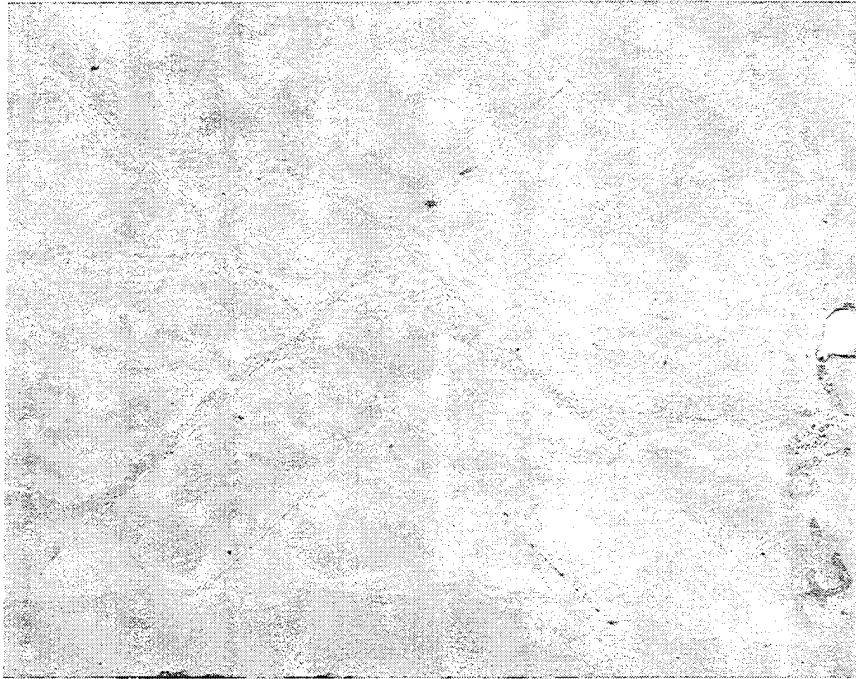


Figure 1. Control formula after 250 hr of salt spray exposure.

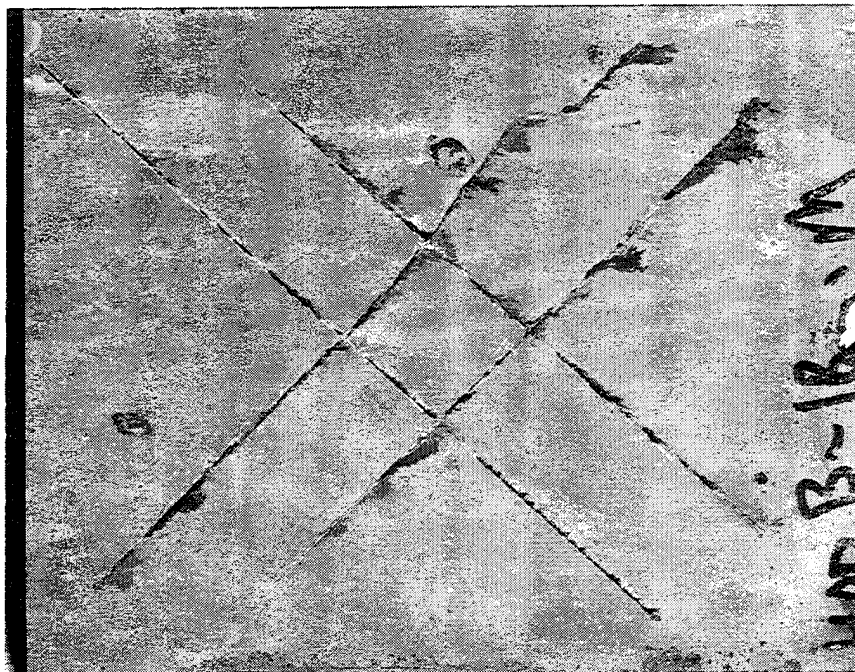


Figure 2. Low VOC formula after 250 hr of salt spray exposure.

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